The Need for Ice Detection Standards

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in collaboration with VTT

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Labkotec
INDUTRADE GROUP

Ice Detection is Needed in Wind Turbines

- To detect when ice build-up starts
- To prevent dangerous ice-throw
- To prevent energy loss
- To protect the wind turbine

How to ensure that ice detection works?

There should be

- certification rules
- standards and
- published best practices

for icing or ice detection tests

Labkotec's Pre-Certification process for LID-3300IP Ice Detector

Labkotec wanted to

- Ensure that LID-3300IP meets standards demanded by modern wind energy operators and
- Express the need for standards

Neutral Third Party for Testing

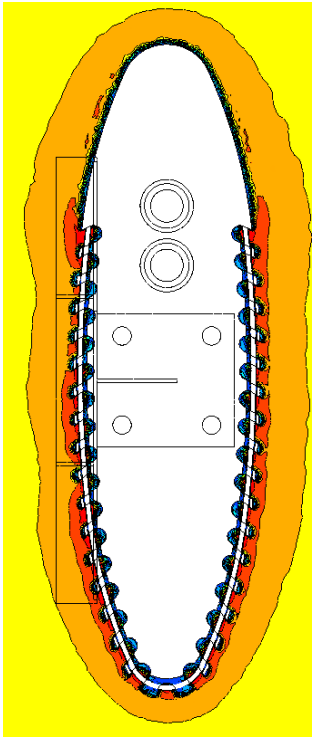
- Selected partner VTT, Technical Research Centre of Finland due to extensive know-how in icing and ice detection

Evaluation Method Development

- In-house methods developed by VTT
- Based on ice detection time in “standard” icing conditions
- Pre-certification process to be the precursor to the formal Ice Detection Standard

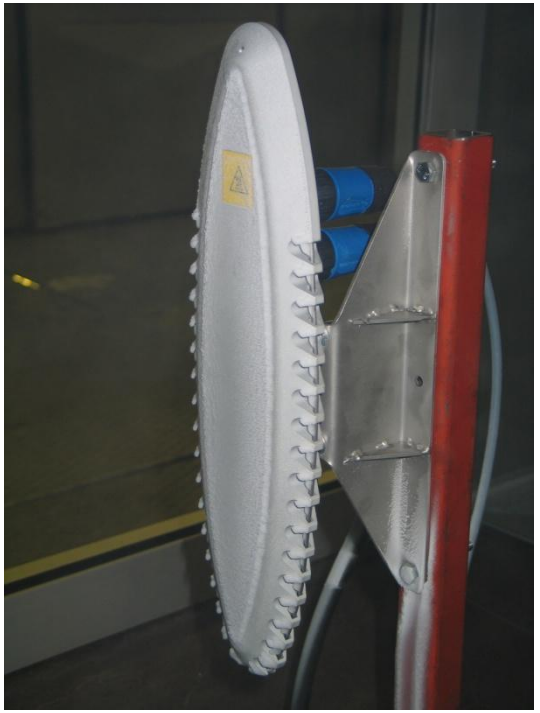
Test Methods

- Tests conducted in VTT's icing wind tunnel, which fulfils the standard icing conditions
- Time calculated from icing conditions start to detector alarm
- Simultaneously the ice build-up on blades was calculated



Test Conditions

- Temperature = -5 °C
- Droplet size = 17 µm
- Wind speed = 10 m/s



Calculation Methods

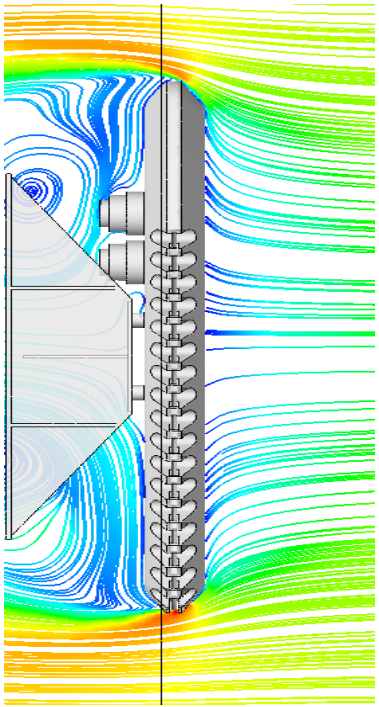
- Ice accretion calculations on wind turbine blades were conducted with TURBICE software
- Ice mass and thickness on blades were calculated and measured when LID-3300IP ice detector gave an alarm

Simulated Wind Turbine

- Typical multi-megawatt turbine
- Blade length 44 m

Test Results

- LID-3300IP gave an ice alarm in average in 45 min after icy conditions started
- Ice mass on blades at alarm point 18 kg
- Ice thickness at alarm point
  - Up to 1,3 cm at 85% radius
  - Average ice thickness 1 cm
  - Ice formed only on leading edge
- No large variations between the tests



Conclusions

- There is reliable link between LID-3300IP alarm and ice build-up on wind turbine blades
- It's feasible to create common standard and certification rules for ice detection

Recommendations

- The ice detection standards should be created
- Common agreement on “standard” icy conditions and best practices
- Helps wind turbine industry in ice detector selection without time consuming and weather dependent tests

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